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Managing Summer Ventilation Systems in the Broiler Houses

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Increasing Evaporative Cooling Pad Set Temperature

Research and field studies have proved that air speed in a tunnel house produces vast majority of cooling, rather than the house's evaporative cooling pads. Though a pad system may decrease a house temperature 10˚F, the relative humidity will increase 25%. Operating evaporative cooling pads in lower 80˚F or even higher 70˚F significantly increases the house humidity, hinders a bird's primary method of heat loss – evaporation of water from its own respiratory system. It is generally recommended that evaporative cooling pads should not be operated at night because the relative humidity of the air outside a poultry house tends to run high at night.

Limiting the use of the evaporative cooling system and reducing house humidity has an immediate benefit – drier litter. In most poultry growing areas during July and August in Southern US, the relative humidity at night is well above 80% (see the fig. 1 thin blue line). When an evaporative cooling pad system runs at low set temperature, the litter does not have any chance to dry up, due to the high daytime and nighttime humidity (see fig. 1 thick blue line). This is evidenced by the wetter litter in the pad end of a tunnel-ventilated house, since this is the most humid area as air being saturated while traveling though the wet pads (in general 5˚F cooler but 12% higher relative humidity than the fan end).

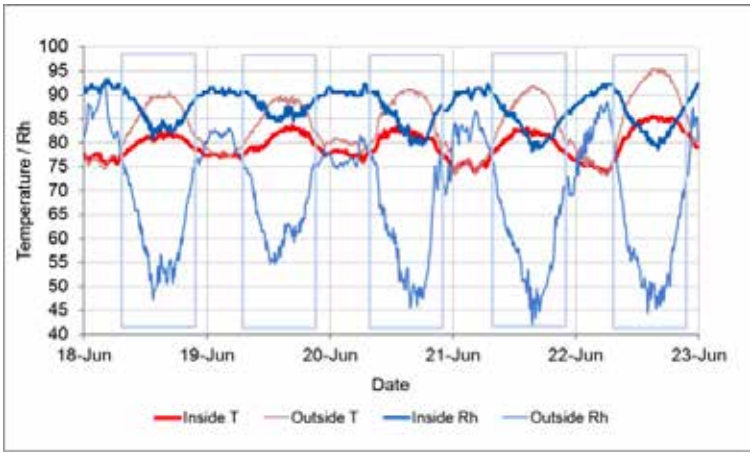

Fig. 1 Inside conditions in house using evaporative cooling pads, and outside conditions.

Raising evaporative cooling pad set temperature worries a lot of people because the houses are warmer. Poultry scientist and engineers at the University of Arkansas and Mississippi State University have been studying the use of sprinkler systems as an alternative cooling method. Although the house had high temperature under sprinkler system (thick red line in fig. 2) in comparison with evaporative cooling pad house (thick red line in fig. 1), the evaporation of water from the bird surface lowers the surface temperature of the birds and increases heat loss from the birds. Over the course of three summers there has been no significant differences in bird performance seen between the houses with sprinkler system compared to those with traditional evaporative cooling pads. With sprinkler system doing the early stage of cooling, grower can set evaporative cooling pad to operate between 85˚F and 90˚F, keeping the house humidity in moderate level (below 80%).

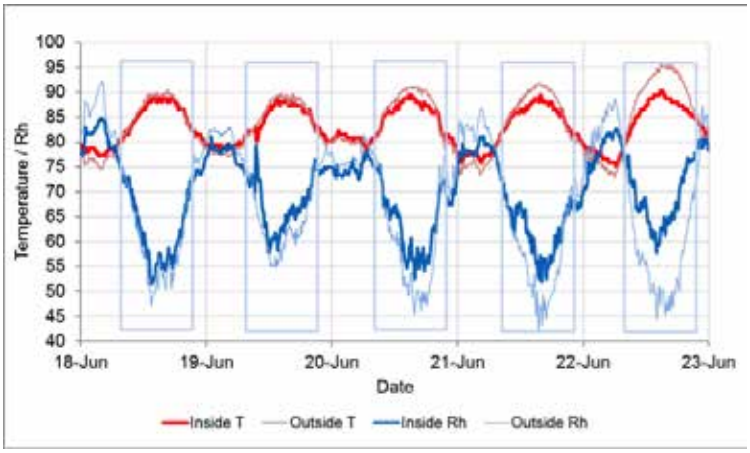

Fig. 2. Inside conditions in house using sprinkler system, and outside conditions.

Maximize Nighttime Cooling by Fans

Birds partition their heat production between sensible and latent depending on the environmental conditions. In summer when temperatures are in lower 80˚F or higher 70˚F, a bird relies largely (60%) on evaporating water from its respiratory system to rid itself of excess heat. When air reaches near saturation, this evaporation becomes nearly impossible. Operating evaporative cooling pad at night pushes the relative humidity into the 90% level, with no additional cooling.
Instead, maximize nighttime cooling by operating tunnel fans all night long when birds are at least 37 days old. This ensures that the birds receive plenty of air speed for cooling throughout the night and gain some relief from potential heat stress during the day. Airflow at high velocity causes a proportional shift from latent to sensible heat loss when temperature is in lower 80 ˚F or higher 70˚F. The most widely used method of making sure that the birds receive adequate nighttime cooling is to lock on tunnel fans at nights. However, one should make sure not run into cool nights when controller tries to transition to inlet ventilation, leading to a high static pressure situation and get an alarm. Another method is to lower the controller set temperature by three to five degrees, which typically will keep the tunnel fans operating all night long. Thirdly, setting tunnel fan OFF temperatures several degrees (instead of two degrees) below ON temperature will allow fan delay turning off as outside temperature drops into the nights.

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